

# Know your 727 hazards

THIS SAFETY GUIDE COVERS THE POTENTIAL HAZARDS  
INHERENT IN THE OPERATION AND SERVICING OF  
THE VARIOUS TYPES OF 727 AIRCRAFT

April 1985

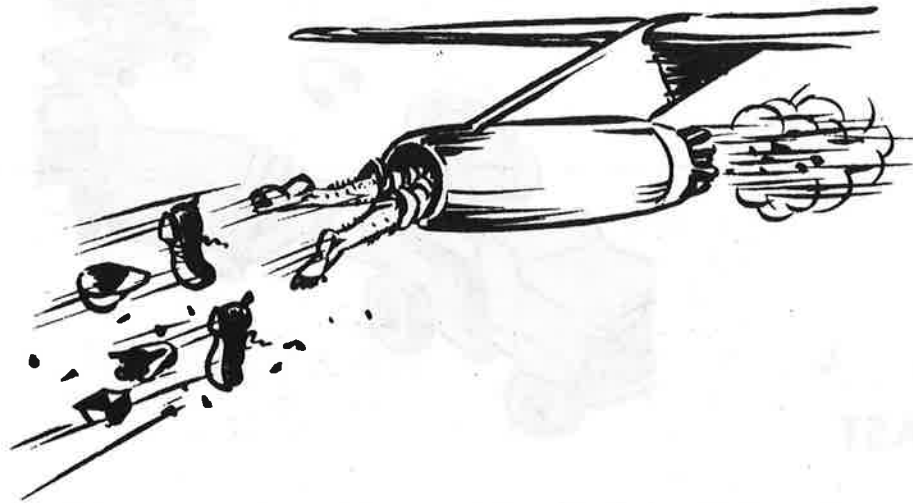
MAINTENANCE TRAINING SECTION / SAN FRANCISCO

IS 311



# **PERSONNEL HAZARDS**

## **General, All Airplanes**



### **INGESTION**

The intake suction of a running jet engine is very strong. Even at idle power, it is equivalent to a 35 MPH wind 25 feet in front of the engine, including the sides of the intake.

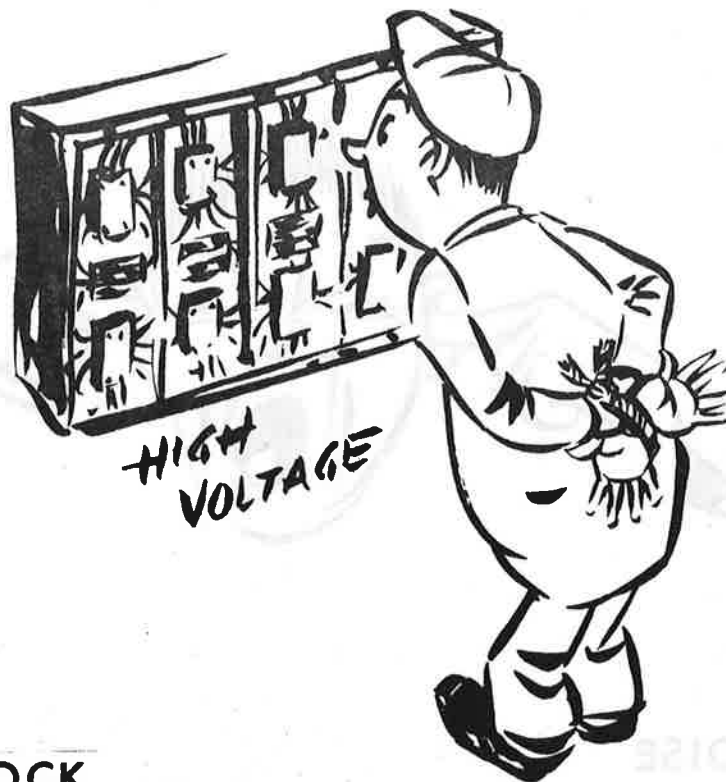
Remember, if any engine is running, the noise level is such that you can't tell which one it is. Play it safe - give them all a wide berth.



## JET BLAST

The exhaust gases present behind a running jet engine are extremely hot and traveling at very high velocity. With the engine idling, the exhaust velocity at 100 feet from the tailcone is about 35 MPH. With the engine spooled-up to breakaway thrust (thrust required to get the aircraft moving), the exhaust velocity increases to 70 MPH.

In the ramp area, care should be taken not to leave cargo carts or ground equipment in the area of the jet blast. Safety records show that ground equipment has been overturned or pushed into other equipment or structures and caused serious damage, all because equipment was moved by the exhaust blast from a taxiing airplane.



## ELECTRICAL SHOCK

Electrical shock hazard is greatest between 100 and 700 volts. Even at low amperage, the voltage or electrical pressure is strong enough to paralyze the victim, causing suffocation. High amperage will burn the victim, while very high voltage causes a muscular reaction and kicks the victim away from the point of contact.

Our airplanes use 115 volt 3-phase 400 cycle AC power to operate many pumps, motors and actuators. If you get your fingers across any one leg of the circuit-to-ground, you will get a 115 volt shock. If you happen to touch two of the three contacts or connectors to an operating unit, you will get hit with over 200 volts AC. You should always make sure that power is "OFF" and the circuit is properly tagged, before working on any electrical system. Even with power "OFF", treat the circuit as if it were "HOT".

If a man receives an electrical shock, it is vital that he gets artificial respiration immediately ... and that you notify the proper authorities as soon as possible.

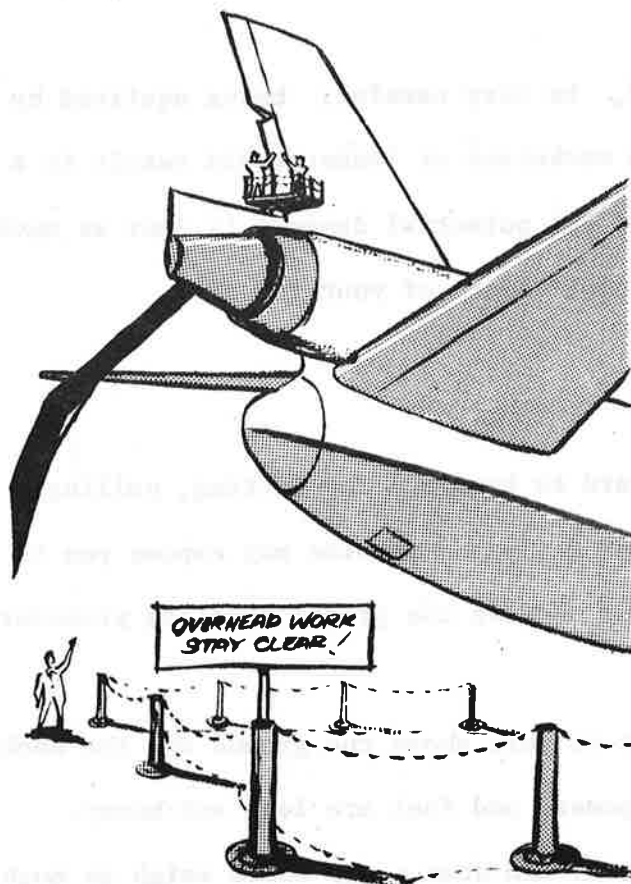




## JET NOISE

Your eardrums are delicate and they are irreplaceable. Even short time exposure to extreme noise levels may damage your hearing. Exposure to jet engine noise is difficult to get away from when you work for an airline, and that's why the medical department supplies earplugs for your use.

It is up to you to take the proper precautions and wear your earplugs when working around the ramp or running aircraft. Jet engine noise can cause temporary hearing loss and without proper protection, over a period of time, the hearing loss may become permanent ... don't take chances ... use your plugs ... and always keep alert to the hazard



## FALLS & FALLING OBJECTS

When working on our airplanes, you are apt to be at considerable heights above the ground, especially on wide body types. For your own safety, be extremely careful of falls. Be sure to use all the approved safety devices, like the harness and lanyard, when working on top of wings and tail surfaces. Guard rails around work platforms must always be in place and checked before you start work. When using ladders or stands to reach the work, be sure they are the correct

height ... don't stretch for that last foot ... or it may well be the last foot. Any doors or hatches left open for maintenance or servicing must be plainly placarded and appropriate guard rails must be installed to protect other personnel from falls.

Also, for the safety of your fellow workers, you must be very careful to avoid dropping tools or other equipment from high work stands. It is a good idea to rope off the area directly below, so that any foot traffic will be detoured around the potential hazard.

Since there are many spring loaded devices and pressurized components on all aircraft, you must always be on the alert for potential traps which could cause problems for you or your fellow workers. For example, when servicing pressurized

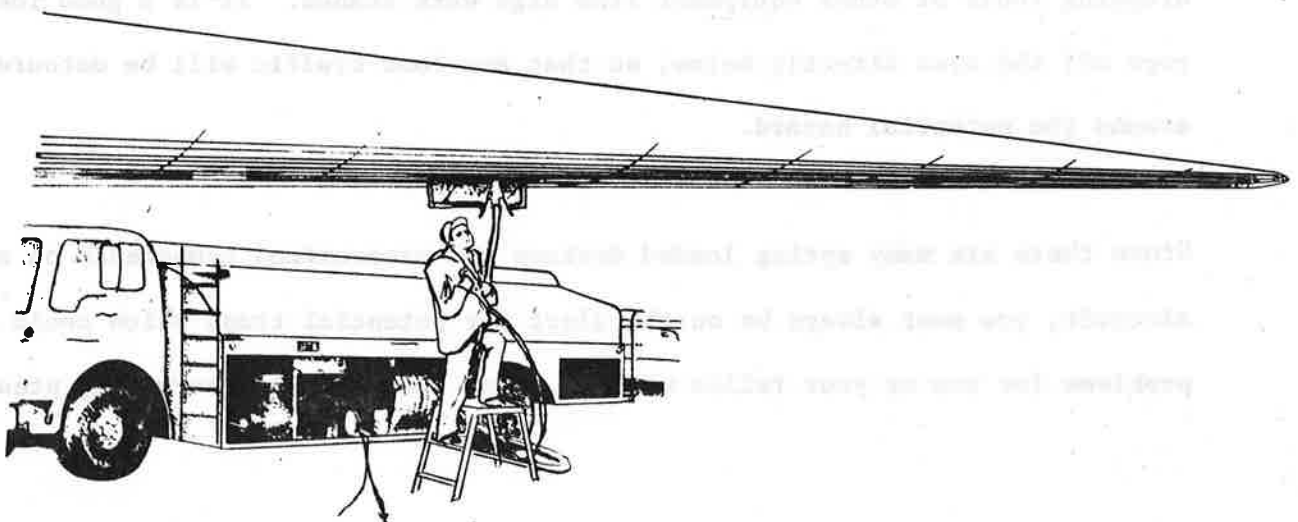
potable water systems from a workstand, be very careful; being squirted by high pressure water when standing on a workstand or ladder could result in a serious fall or injury. Being aware of the potential dangers is just as much a part of your job as fulfilling the requirements of your job card.

## LIFTING

Many aircraft parts are heavy and awkward to handle. The lifting, pulling, and pushing you do while performing your daily job routine may expose you to personal injury unless you take care and observe the proper handling procedures.

Some aircraft service panels are 7 feet or more above the ground and the hook-up lines for air conditioning, ground power, and fuel are long and heavy.

Some passenger doors weigh over 400 pounds and some cargo doors weigh as much as 1000 pounds. A loaded buffet weighs in at about 1800 pounds and an engine cowl can be as heavy as 675 pounds. Whenever you work around an aircraft, be sure to use the proper ladders and work stands so you will be at the height to do the job comfortably and safely. When a heavy unit is to be removed or installed, always use the proper lifting equipment and arrange to have sufficient help to prevent personal injury to yourself or your fellow workers.





## BURNS

There are several ways you can get burned when working around jet aircraft.

The most obvious danger is the exhaust from a running jet engine or APU.

Also, when the pneumatic system is pressurized, temperatures can exceed 400°F and the pneumatic ducting and valves get quite hot. You should always be cautious around a running engine.

Less apparent, but equally capable of inflicting painful burns, is the hot tailpipe of a recently shut down engine ... or the heated drain masts and probes. The safest approach is when you consider all these items as potentially dangerous and give them a wide berth.

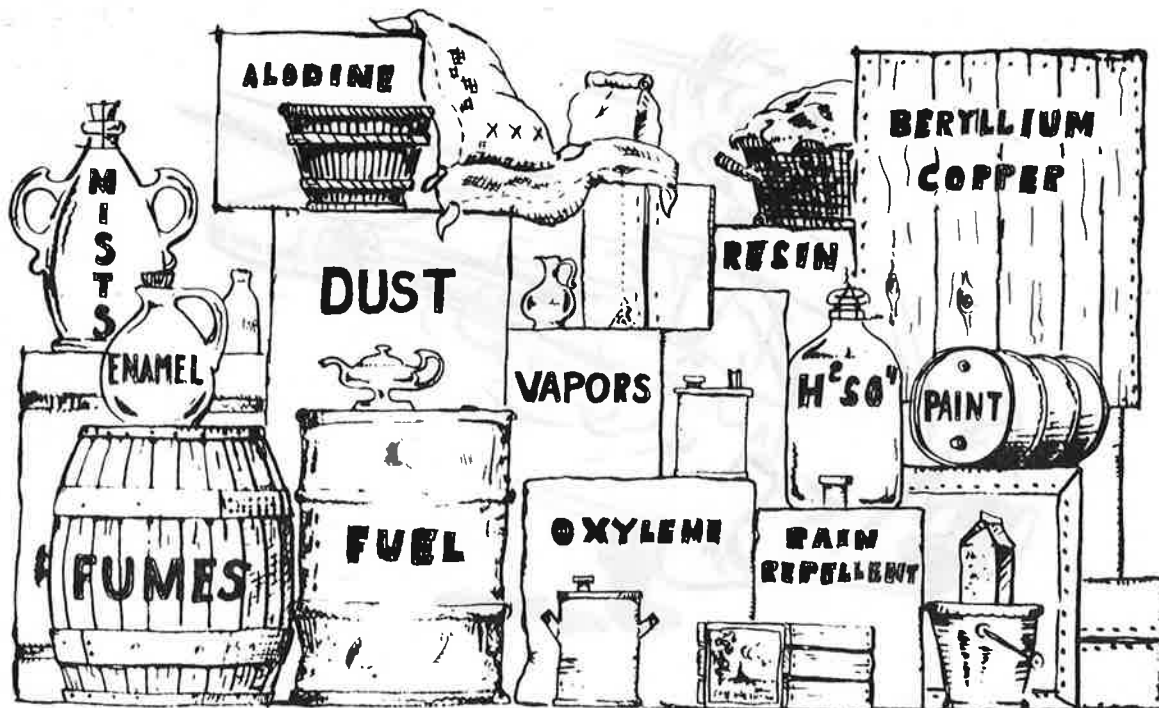


# CORROSIVE, TOXIC, & RADIOACTIVE MATERIALS

Polyurethane paint is used on all of our aircraft. This material is toxic until it has thoroughly dried. You must always wear a respirator when working around wet urethane paint. Uncured epoxy resins and adhesives can also be toxic. Dust from fibreglas and plastic resins also present a hazard ... and require that you use a respirator.

Uranium balance weights are used on some control surfaces and may release radioactivity if the protective finish is damaged. Care should be taken when working around this type structure.

Radioactive "Exit Signs" are installed on all of our aircraft. Under no circumstances are any of these signs to be disassembled by any element of United Airlines.



Alodine solution, frequently used in surface treatment of aluminum, is a corrosive chemical. It can cause severe burns to the skin and eyes. When working with this solution, you should always protect yourself with a face shield and rubber gloves. If by chance you do get splashed in the face with this chemical, washing or irrigating the affected area with copius amounts of flowing water is necessary for 10 to 15 minutes ... then get medical aid immediately.

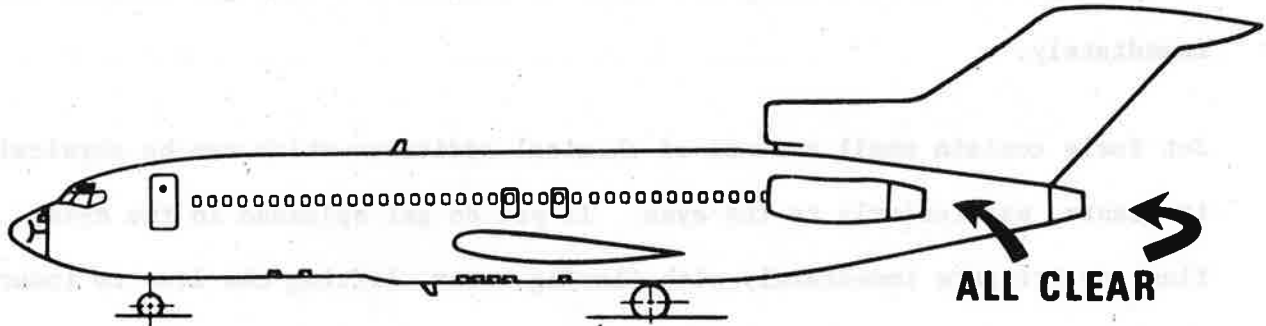
Jet fuels contain small amounts of chemical additives which can be physical irritants, particularly to the eyes. If you do get splashed in the eyes, flush or irrigate immediately with flowing water, lifting the lids to insure that you are doing a thorough job ... then get medical assistance as soon as possible.

The electrolyte in a lead-acid type battery is also very corrosive and the gas is explosive as well. When working around batteries, you should always wear a full face shield. The treatment is the same as with other corrosive materials ... copius amounts of flowing water to wash the affected area and then get medical aid immediately.

Rain repellant fluid is both corrosive and toxic. Here you must beware of the fumes as well as the physical contact. In any case, you must always wear an approved type of respirator when working with this material, especially with a spill.

Beryllium is another potential danger present in many aircraft parts and components. Beryllium copper is used for bearings and bushings throughout the aircraft as well as in many aircraft instruments. The dust or shavings from this material can accumulate in your lungs with fatal results. A respirator must be worn whenever you work in an environment where this hazard exists.

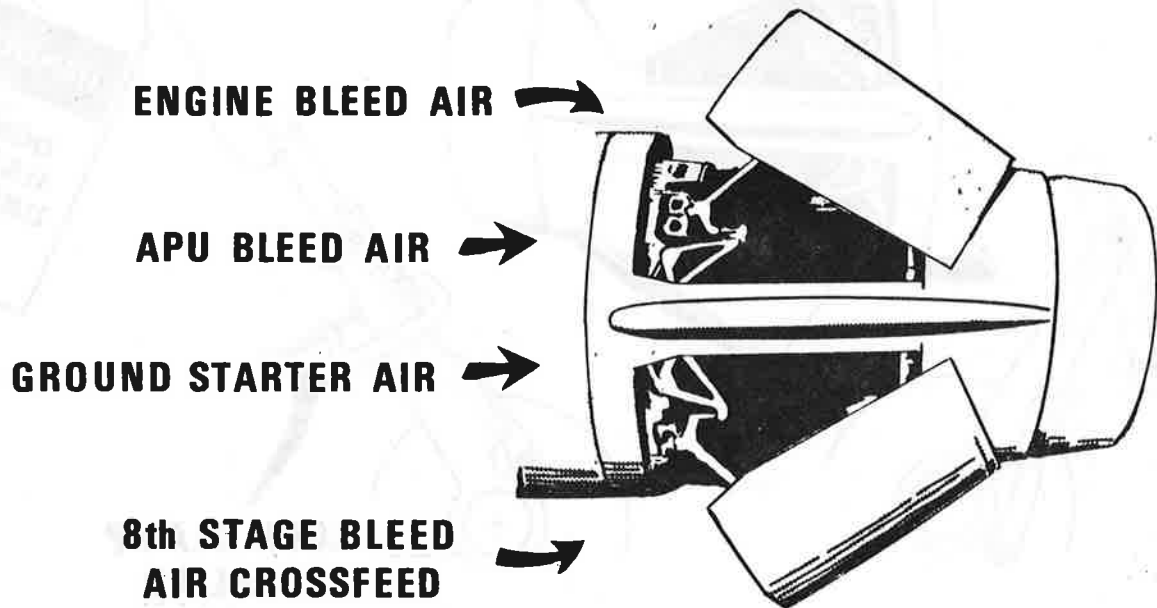
# 727



## "PRECAUTIONS"

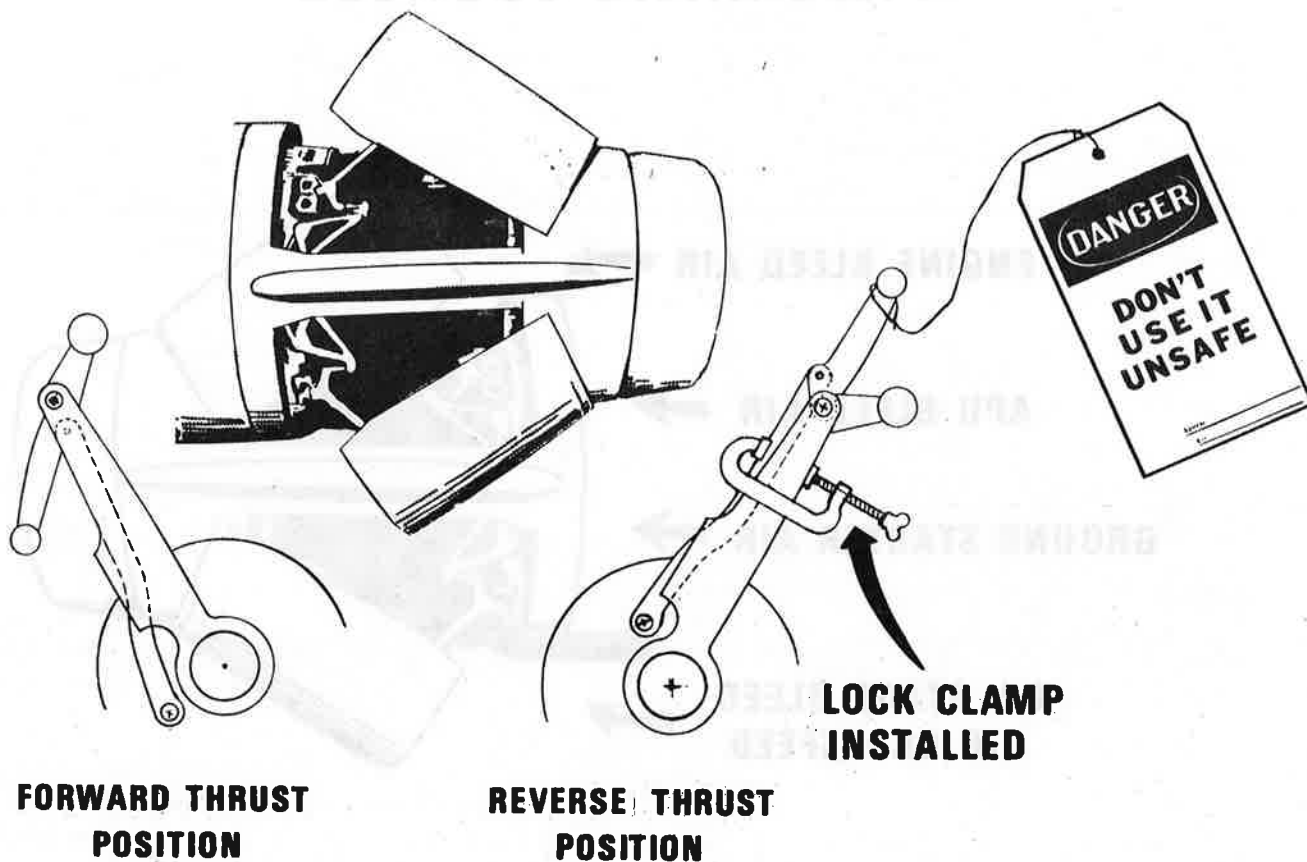
Although 727 type aircraft come in a variety of sizes and with many different features, many of the same hazards exist for all personnel who must service and maintain these aircraft. When working around a 727 there are a number of basic precautions that you must observe. First, always check to be sure all personnel are clear of the thrust reversers before starting the APU or the ground power supply.

# PNEUMATIC SOURCES



The reverser system on the 727 can be operated by four separate pneumatic sources. First, bleed air from the engine can operate the reverser, as well as bleed air from the APU, or bleed air from another engine, and of course, pneumatic air from a starter truck. Pressurizing the pneumatic manifold from any source will supply air to the thrust reverser control valves.

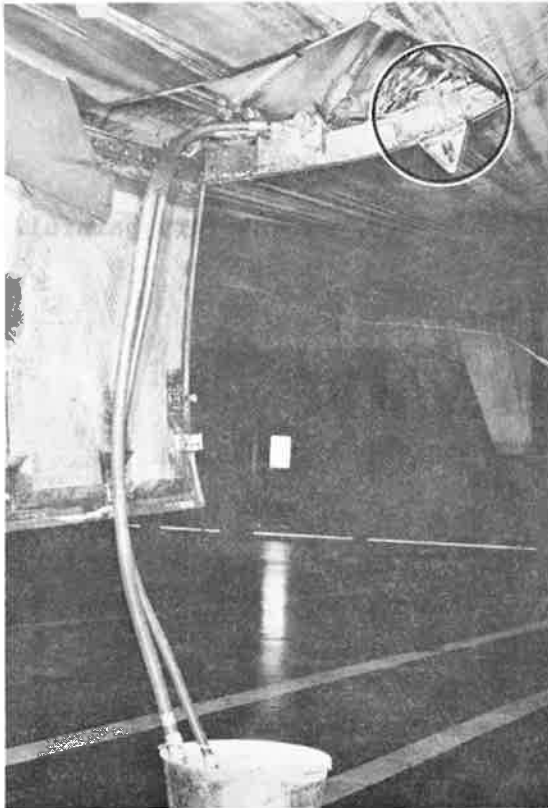
# TAILPIPE & REVERSER



When working on the tailpipe or reversers, always install the reverser lever locking clamps to keep the reverser levers "UP" in the forward thrust position, and be sure the two engine bleed valves are closed and that the switches on the flight engineer's panel are tagged. Unexpected operation of a thrust reverser is a real hazard to anyone working in the area.

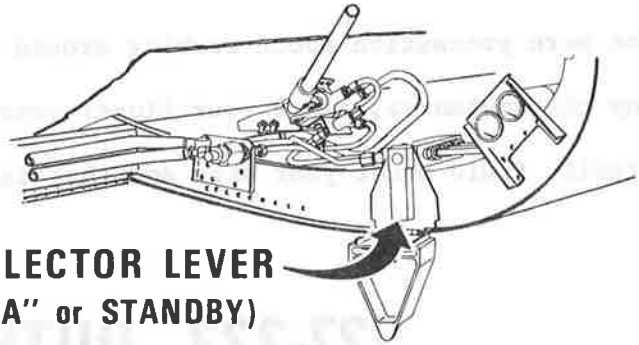


# DEPRESSURIZE RESERVOIR



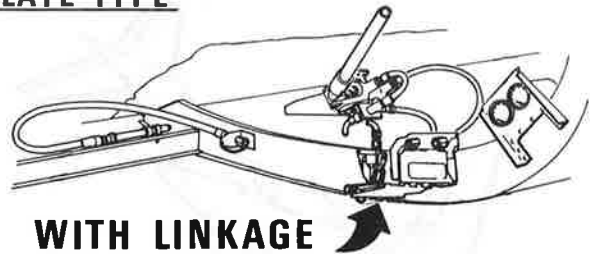
EARLY TYPE

**SELECTOR LEVER**  
(**"A"** or **STANDBY**)



LATE TYPE

**WITH LINKAGE**  
(**NO LEVER**)



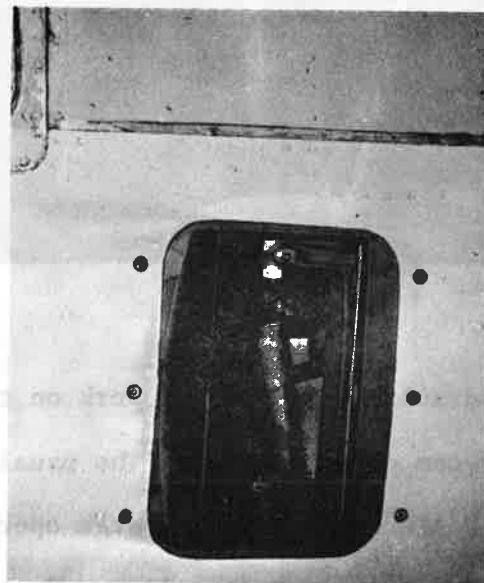
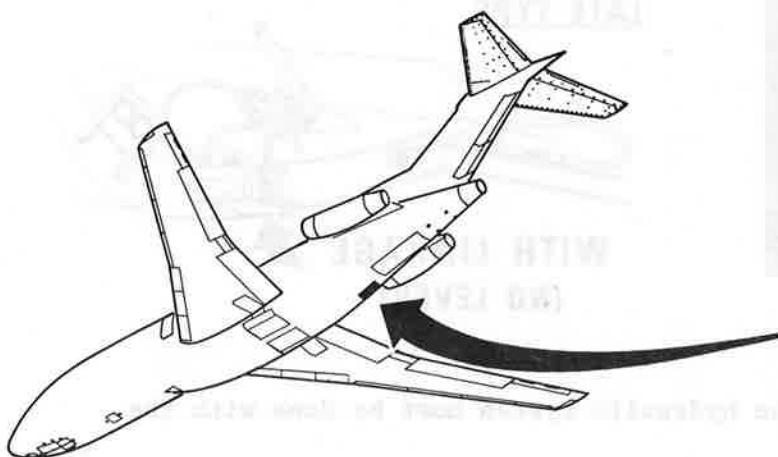
Hydraulic servicing or work on the hydraulic system must be done with the system depressurized. The usual situation is to have the APU running and the air conditioning system operating. A mechanic goes to remove a hydraulic unit or disconnect a line and gets a face full of fluid because the system is pressurized. To prevent the release of hydraulic fluid under pressure, you must observe all safety precautions at all times.

On early 727 aircraft, reservoir pressure is vented through the overflow hose when the servicing selector valve is positioned to "System A" or "Standby". Open the valve slowly to prevent any fluid in the ventline from splashing out of the container and onto you. On the rest of the 727 fleet, reservoir pressure is vented through the overflow valve, which is linked to the small service

door. Opening the service door also opens the overflow valve. Keep your face away from the overflow ventline while opening the small service door.

One more precaution about working around hydraulic systems ... never, under any circumstances, place your finger over a leak because it could force hydraulic fluid under your skin and that is not only hazardous, but very painful.

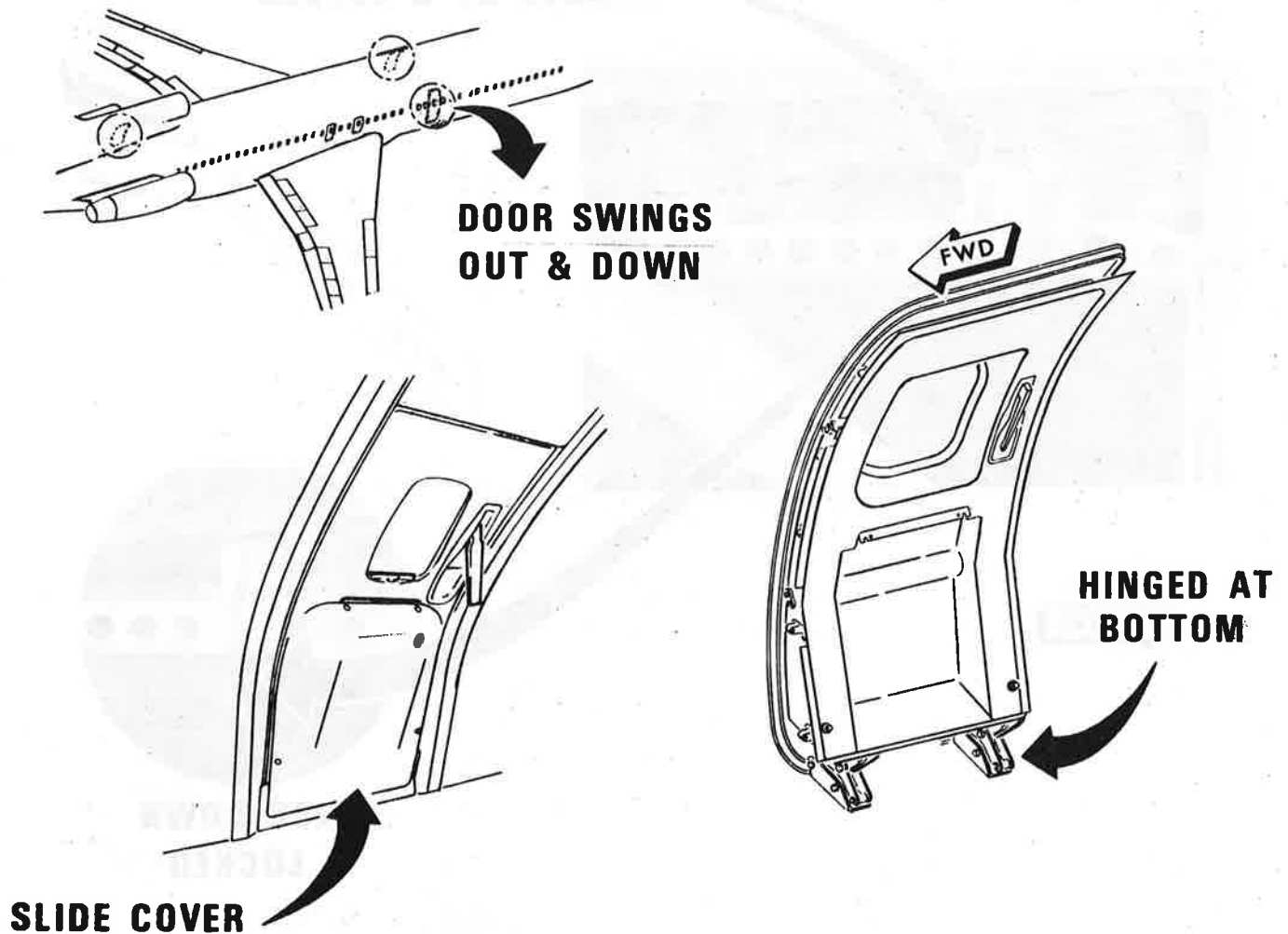
## 727-222 OUTFLOW VALVE



### WATCH YOUR HANDS

Another door with a possible handtrap is the motor operated pressure outflow valve on the 727-222. During any ground operation, never put your hand in the outlet for any reason whatsoever.

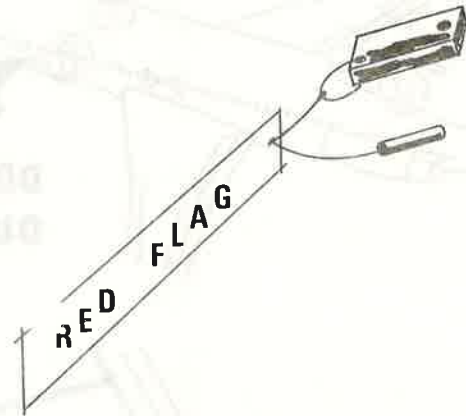
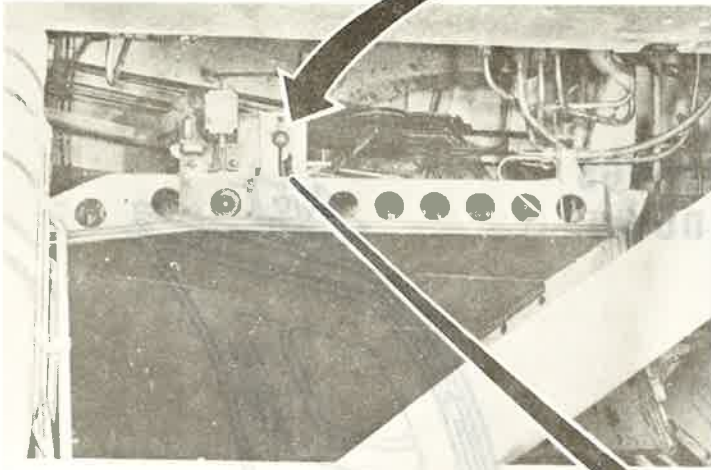
# TYPE 1 EMERGENCY EXIT DOORS



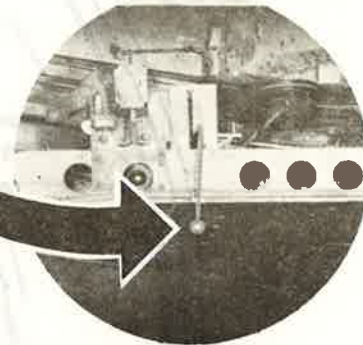
Also when working around the 222, you should be aware that the Type 1 emergency exit door is hinged at the bottom and swings out and down. These doors are quite easily opened from the inside and could be a hazard to the opener as well as anyone working directly below.

# OPEN MAIN GEAR DOORS

REMOTE DOOR CONTROL  
HANDLE UP & LOCKED

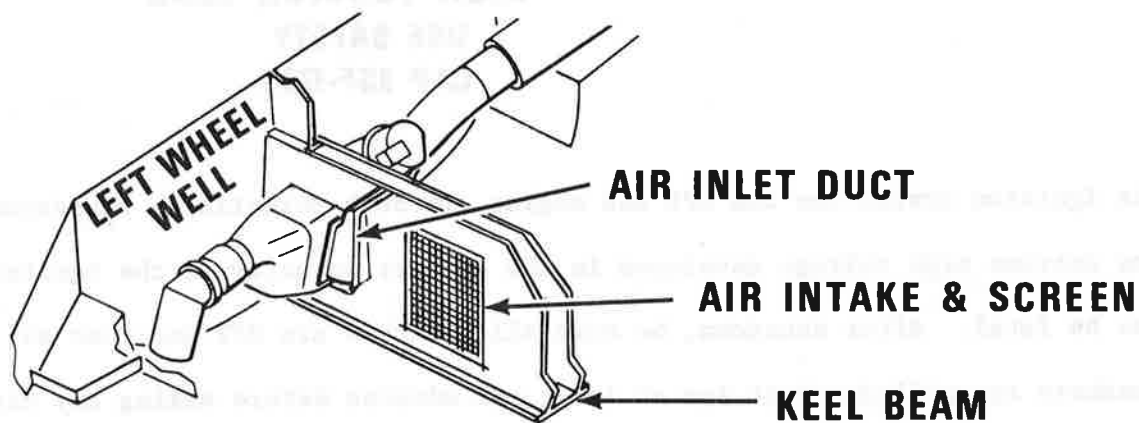
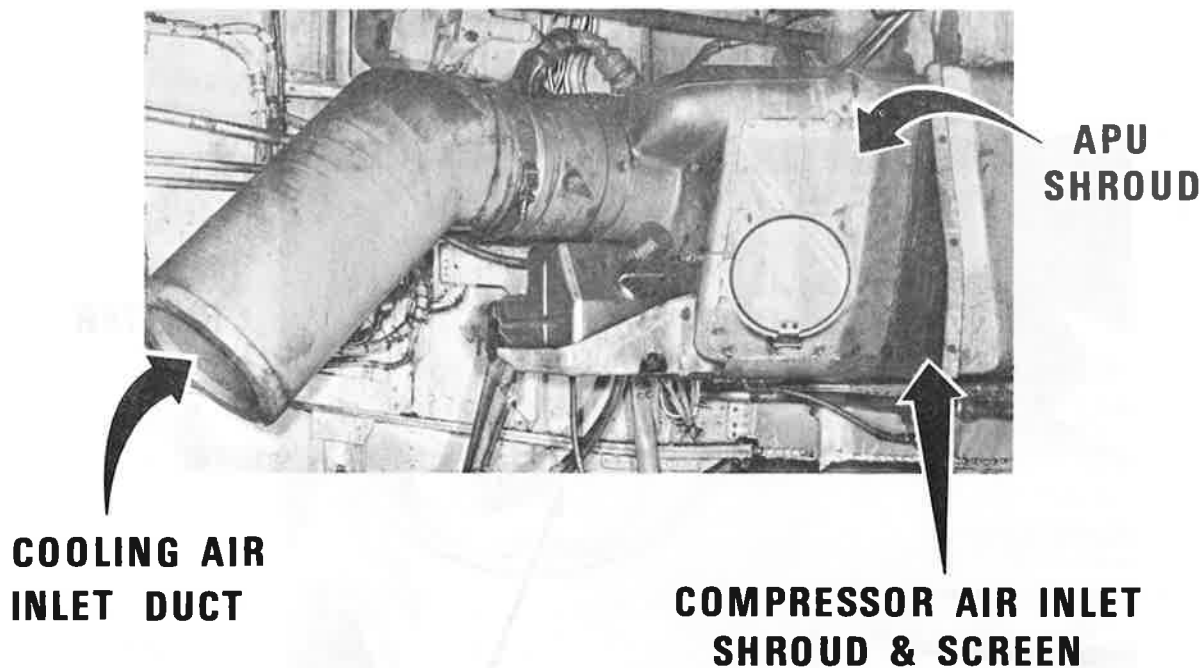


← OUTBD



DOOR DOWN  
& LOCKED

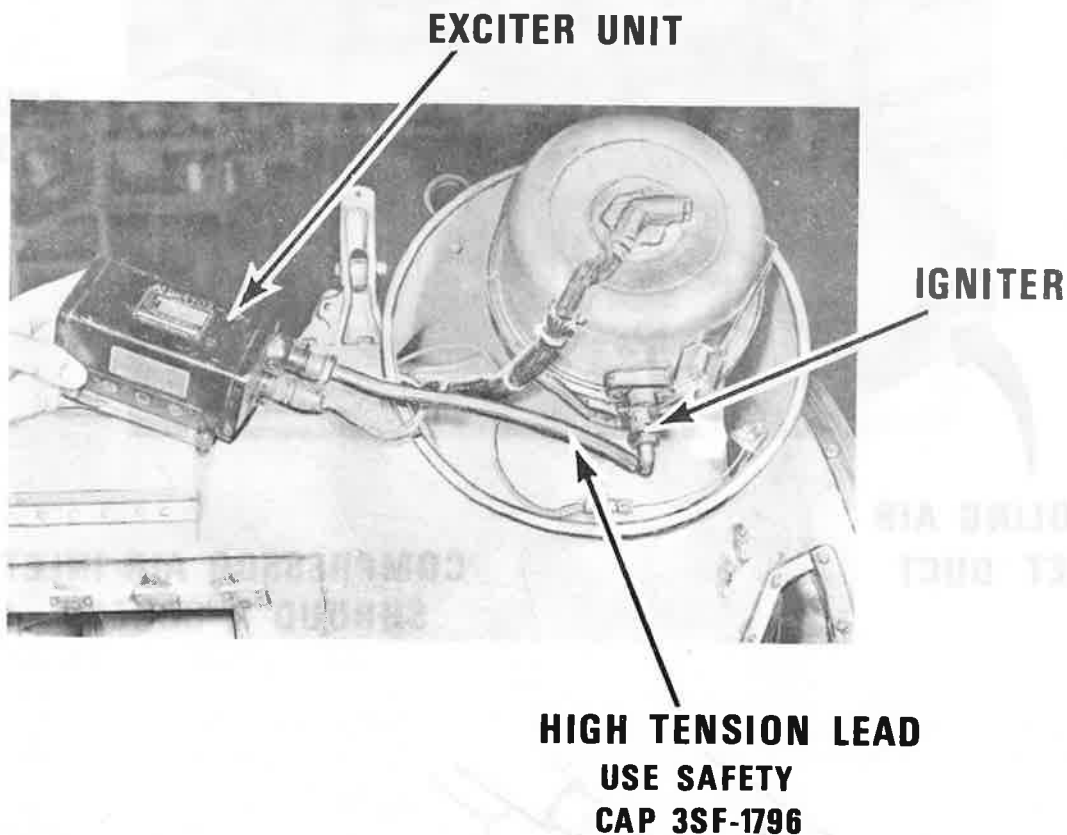
Each wheelwell door has an operating handle located just inboard of each main gear. To gain access to the wheelwell, you must pull down on the handle and then lock it into the detent in the down position. An additional lock is required as a safety precaution. Insert the lock in the handle slot and use the attached pip pin to hold it in place. The long red flag is a good visual warning that the lock is in place.



The APU is mounted crossways in the keel beam on the centerline of the aircraft. The compressor intake is also on the centerline with a screen inlet in each wheelwell. You should be very careful to keep small objects away from the inlet whenever the APU is running.

The generator cooling air inlet is not screened and here too, you should keep lightweight materials such as paper or cloth away from the inlet.

# IGNITION SYSTEM

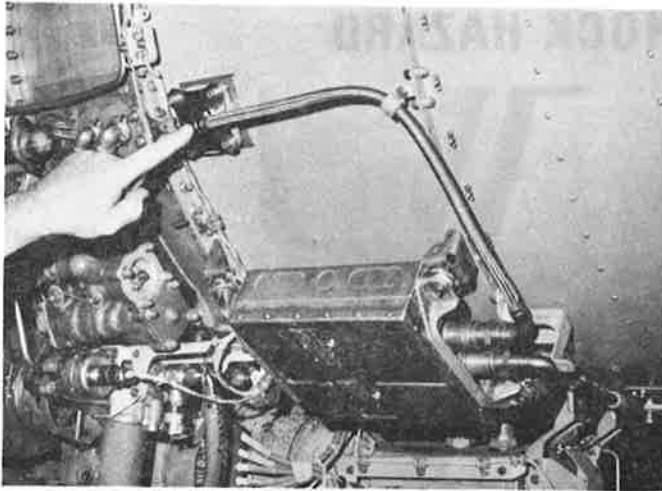


The ignition system for the APU and engine are both potentially dangerous. The extreme high voltage developed in the exciter to activate the igniter can be fatal. After shutdown, be sure all switches are OFF and that all breakers are pulled. Wait for at least six minutes before making any disconnections. To insure complete discharge of the exciter capacitors, short the high tension lead to ground. Then install a safety cap over the end of the lead. The cap number is 3SF-1796.

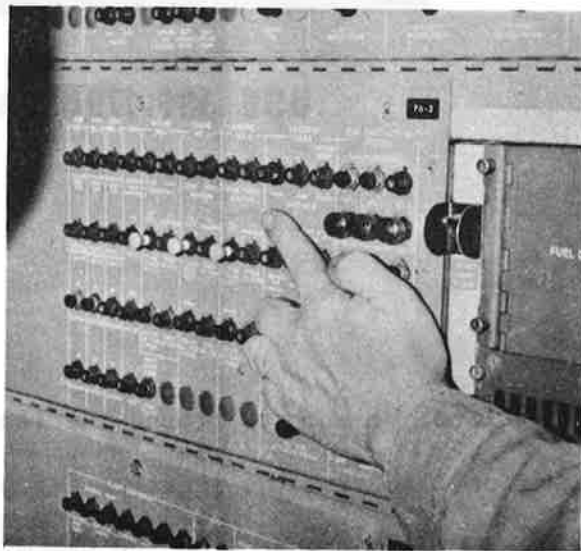


# ENGINE IGNITION

**"CAN BE FATAL"**

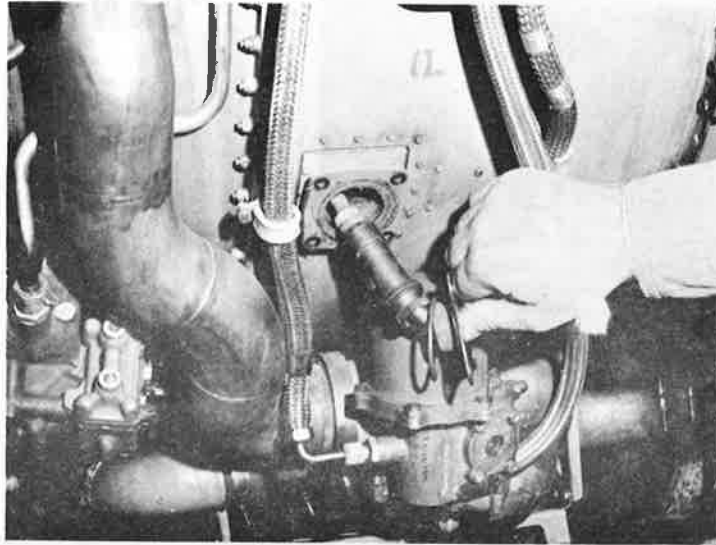


**PULL BREAKER  
WAIT 6 MINUTES**



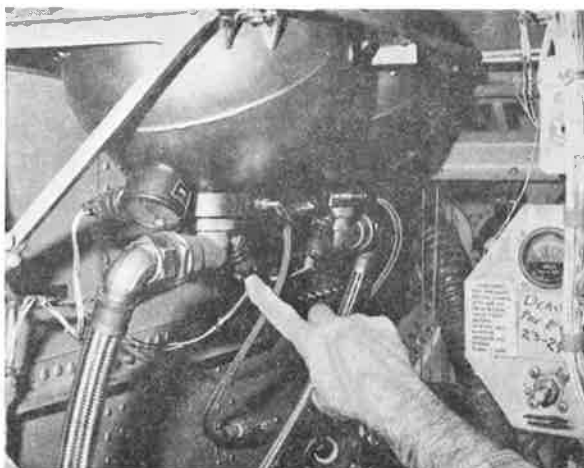
Like the APU ignition system, the engine ignition system can also deliver a fatal charge unless certain precautions are taken. First, never attempt any work while the engine is running. After shutdown, trip the ignition system circuit breaker on the essential bus panel in the cockpit; then, wait at least 6 minutes before attempting any further work.

## **GROUND IGNITOR TO REDUCE SHOCK HAZARD**



### **USE 3SF-1796 SAFETY CAP**

At the igniter, be sure to ground the lead to the cover plate before removing the ignition lead from the igniter. After the lead is removed, cover the end with the safety cap, just like you did with the APU igniter lead. The cover is the same type.

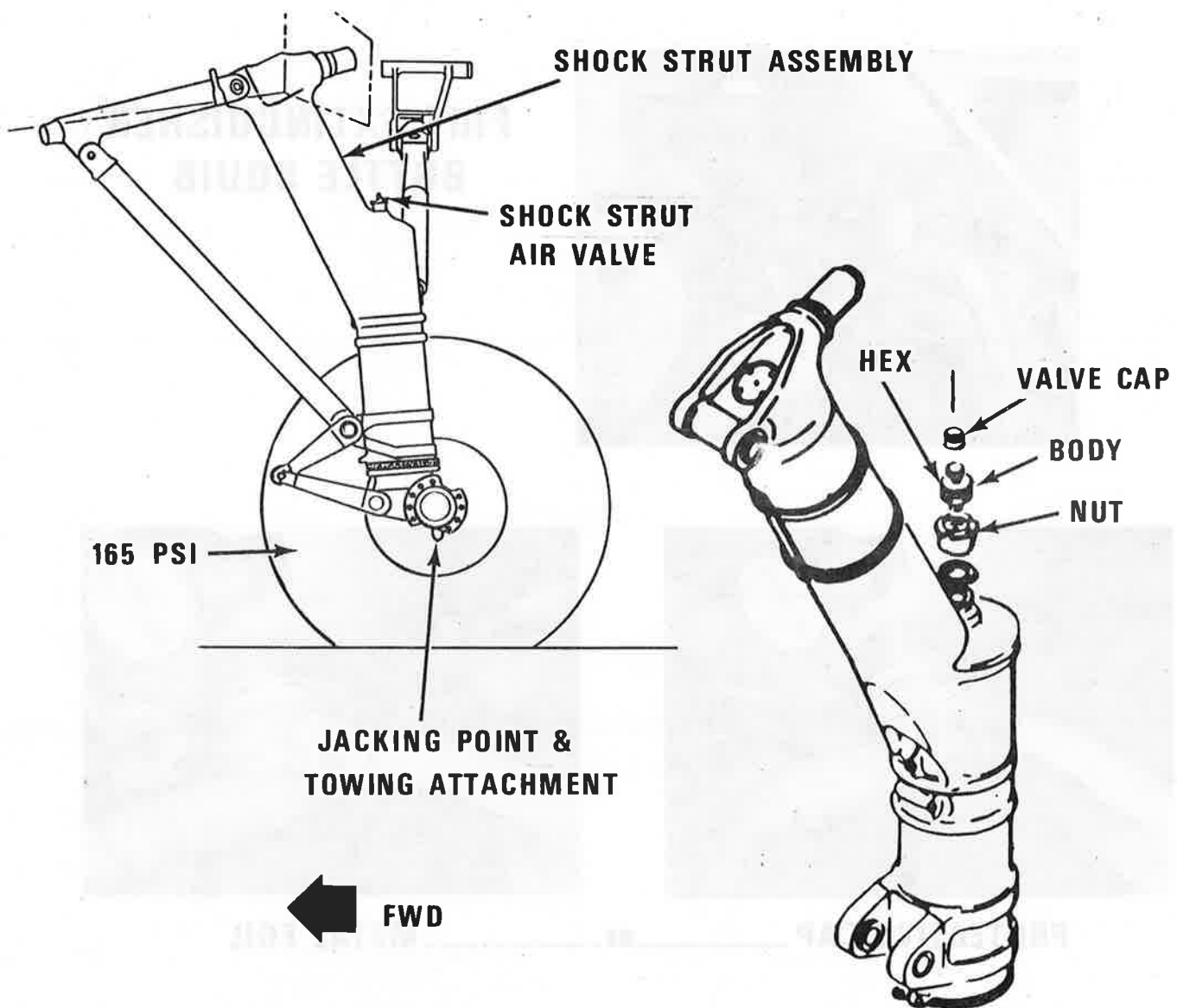


## FIRE EXTINGUISHER BOTTLE SQUIB



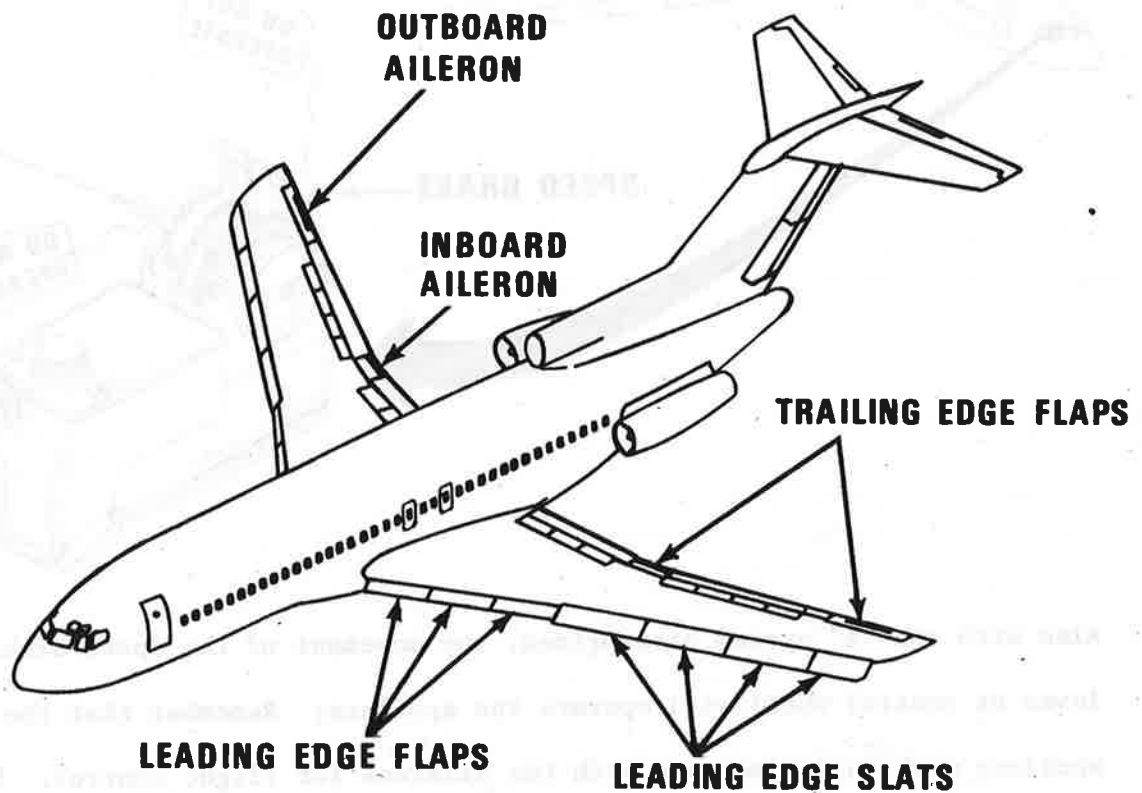
**PROTECTIVE CAP \_\_\_\_\_ or \_\_\_\_\_ METAL FOIL**

The next item is the engine fire extinguisher bottle squib in the right hand aft stair area. The squib has limited life and must be removed for "time", as called out on the routine check job cards. Since the squib is an explosive, a protective cap must be installed on the end of the squib before any further handling. As an alternate procedure, the electrical pins on the squib can be jumpered with metal foil.... then the cartridge can withstand further handling safely.

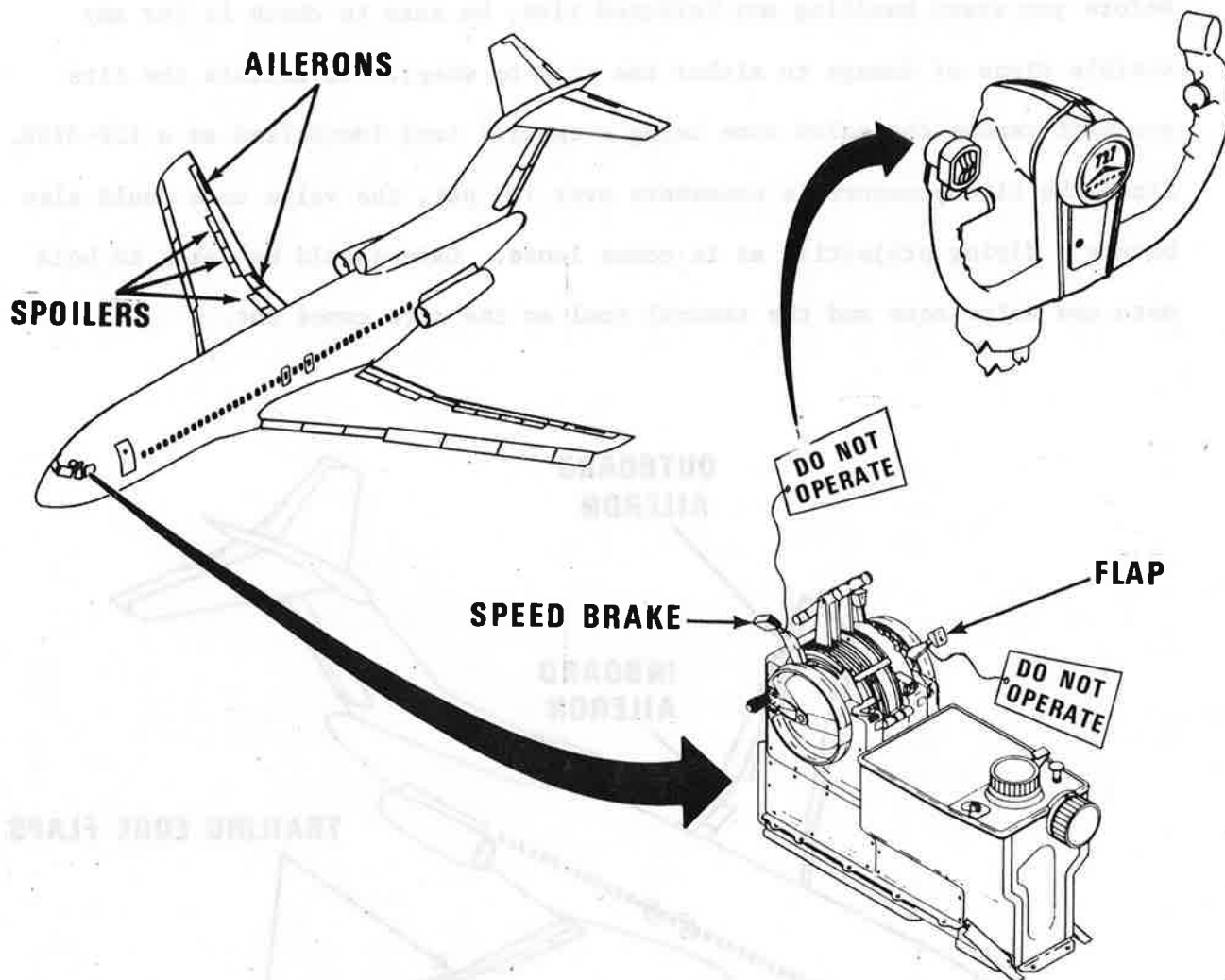


To service any shock strut it must first be depressurized. To release the air pressure from the strut first remove the valve cap; then loosen the upper hex nut on the valve body about two (2) turns. After the pressure is bled off, you can remove the valve body and service the strut. If you try to remove the valve body with the strut pressurized, it could become a flying missile and cause serious injury to you or someone else working nearby.

Any inflated aircraft tire also has a dangerous explosive potential. Before you start handling any inflated tire, be sure to check it for any visible signs of damage to either the tire or wheel. To deflate the tire you must remove the valve core using a special tool identified as a 1SF-3228. Since the tire pressure is somewhere over 165 psi, the valve core could also become a flying projectile as it comes loose. Care should be taken to hold onto the valve core and the removal tool as the core comes out.

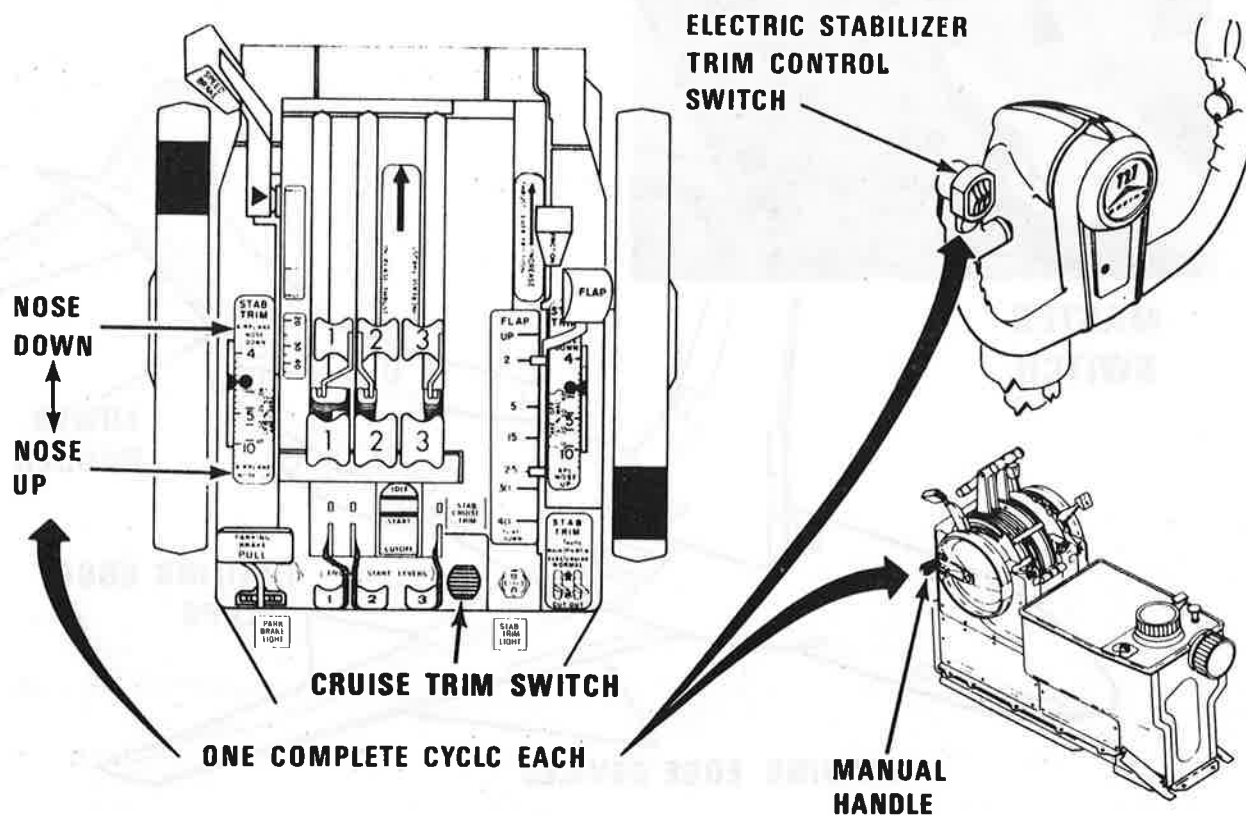


Since many of the flight controls work in various combinations, caution should be used when operating any of the controls. For example, when the trailing edge flaps are in any position other than full up, the outboard ailerons will move with the inboard ailerons. The leading edge flaps and slats do not all extend or retract at the same time. With the hydraulic system depressurized, the leading edge flaps will tend to droop. However, with the "A" system pressurized, these flaps will immediately snug up to the full retracted position, so you must be cautious at all times.



Also with the "A" system pressurized, any movement of the speed brake lever or control wheel will operate the spoilers. Remember that the spoilers work in conjunction with the ailerons for flight control. Whenever you work in the area of spoiler panel movement, you should install surface locks and leading edge flap locks should be used when you work in those areas. In the cockpit, all handles should be tagged for safety.





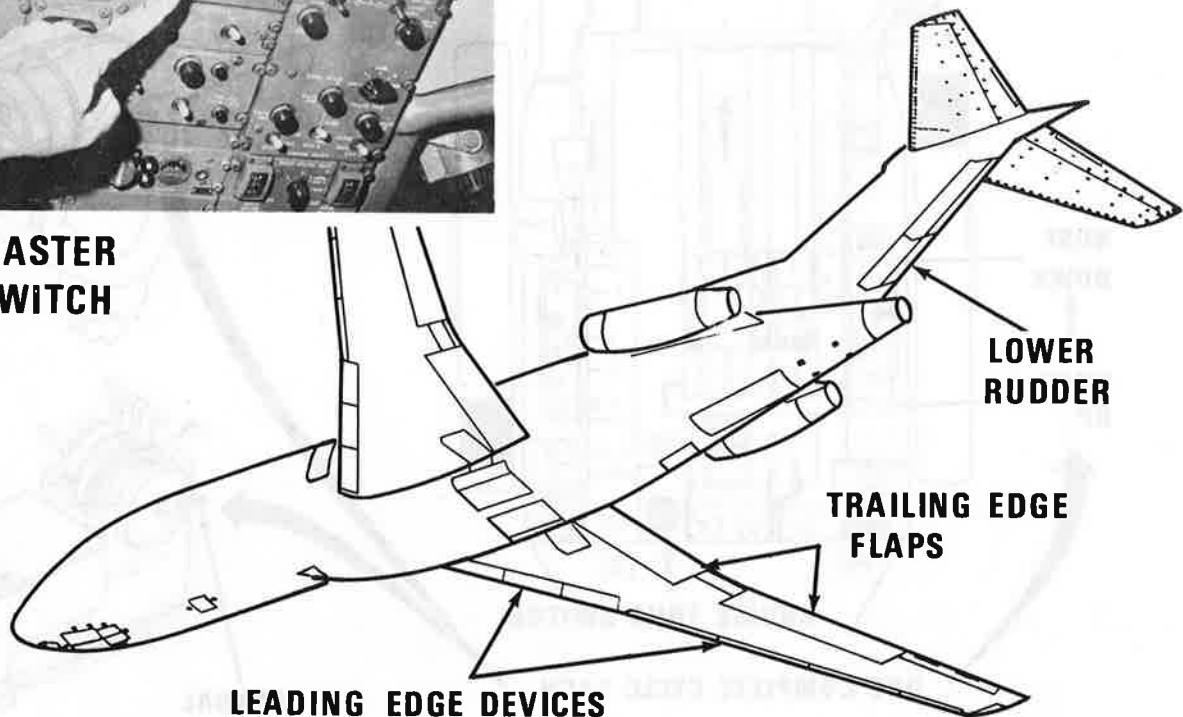
Whenever you depress the trim button on the control wheel, the horizontal stabilizer trim wheel will rotate at high speed. Be sure the area around the trim wheel is clear before depressing the trim button and watch out for that handle if it is sticking out.

If the cruise trim switch is operated, the trim wheel will also rotate, although much slower... but it can still whack you if the handle is sticking out.

# HYDRAULIC SYSTEM

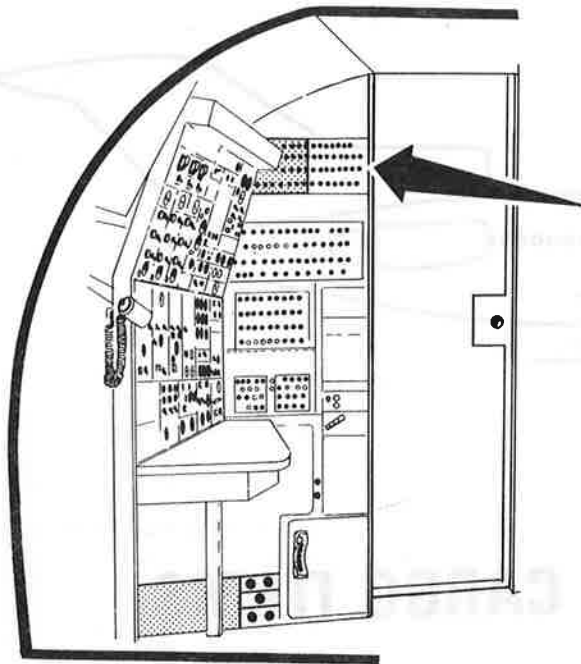


**MASTER  
SWITCH**



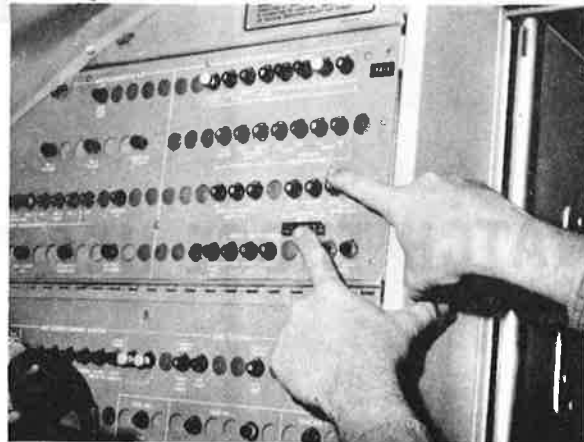
A standby hydraulic system is provided on all 727 aircraft as a backup for the "A" system and the "B" system. The standby system is controlled by three switches on the pilot's overhead panel marked "alternate flaps". There is a guarded master switch and two separate switches for the inboard and outboard flaps. Whenever the master switch is turned "ON", a standby hydraulic system for the lower rudder is also activated. This means that you could have both the "A" system and the "B" system unpressurized, yet any movement of the rudder pedals would move the lower rudder and there is nothing placarded to warn you of the potential danger. As soon as you touch either flap switch, the leading edge devices will drop and the trailing edge flaps will start to move. The trailing edge flaps will only move

as long as you hold the switch. The lower rudder will move when you move the rudder pedals, so you can see that it is important that you clear all affected areas before operating this system.



## COCKPIT WINDOWS CIRCUIT BREAKERS

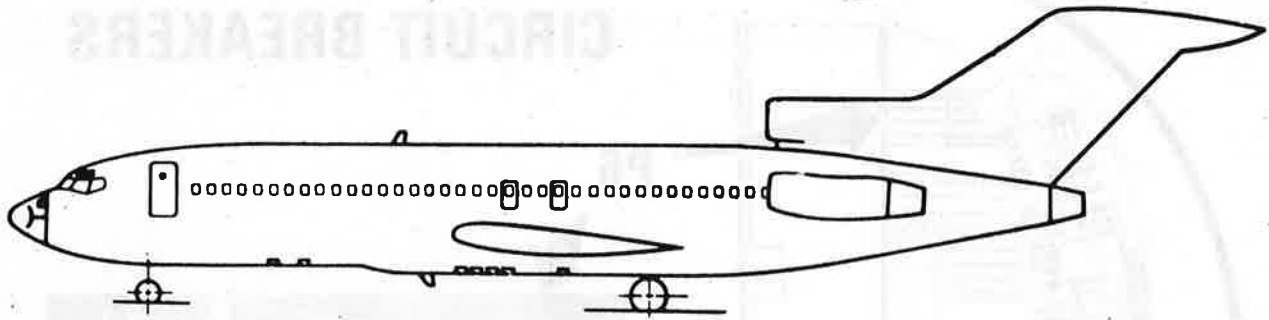
P6



### PULL & TAG

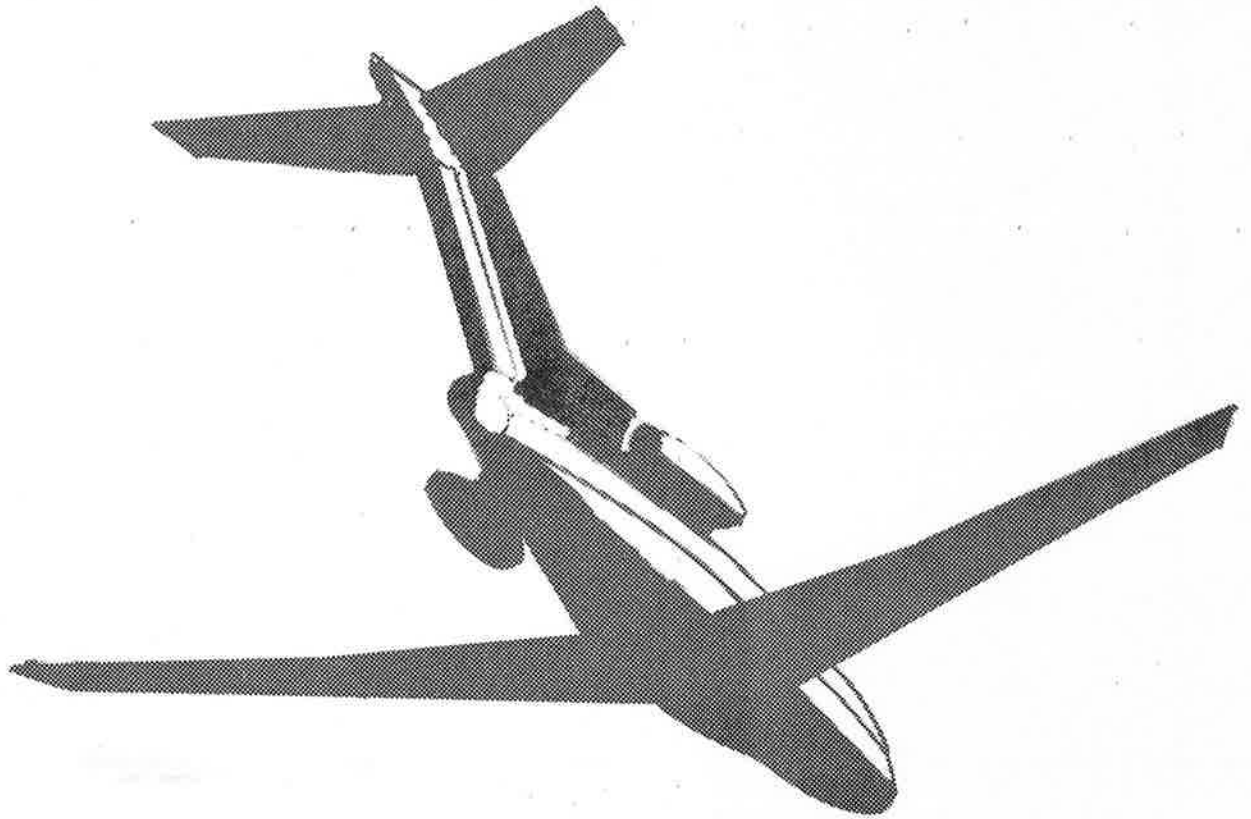
Whenever you have occasion to work on the cockpit windows, be sure to pull and tag the appropriate circuit breakers on the P6 circuit breaker panel. In the window heat system, the electrical power can be as high as 400 volts AC.... so use extreme care.

# 727-222



## WATCH THOSE HEAVY CARGO ITEMS

During any cargo operations on the 727-222 care should be taken to keep most of the weight forward of the main gear as the plane is either loaded or unloaded. The 727-222 tends to be a little tail heavy because of its extended length so any heavy cargo items should be loaded first in the front end of the aircraft. Also, when unloading heavy items, the ones aft of the wheels should be unloaded first.



We've covered a number of the most obvious problems that you may encounter when working around various types of 727's. There are others in almost every job you do .....

The observance of all safety procedures is just as much a part of your job as complying with your job card instructions. Any time you approach any jet aircraft, remember the potential dangers and the traps. Approach each job as if the component or part was physically hot, electrically hot, or running .... and you will be protecting yourself as well as your fellow workers.



It is common a number of the most common types of aircraft  
which require special attention of 100 ft. There are others in which  
which the job is done.

The clearance of all other aircraft is just as good as that of  
in working with the job and construction. The other types are  
for aircraft, however the potential danger and the other. Aircraft  
job as it is the subject of this was described in a relatively few  
minutes ... and the will be continuing process as well as that follow

continued.